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Spaceport News

John F. Kennedy Space Center - America's gateway to the universe

www.nasa.gov/centers/kennedy/news/snews/spnews_toc.html

Space X, Dragon begin new chapter in space

By Steven Siceloff
Spaceport News

SpaceX Corp. tested its Falcon 9 and a fully functioning Dragon spacecraft combination during a brief mission launched from Cape Canaveral Air Force Station on Dec. 8, 2010. The capsule parachuted back to Earth about three hours after liftoff following maneuvers in orbit, a first for the privately owned company.

Flames erupted from the base of the Falcon 9 at 10:43 a.m. as it sat at Launch Complex-40. A few seconds later, the rocket and its Dragon pushed above the surrounding lightning towers and headed into orbit.

The first stage separated on time and the second stage took over as planned. A camera on board the rocket showed the Dragon separate from the second stage and trunk to orbit on its own.

After working through its maneuvers, the Dragon fired its braking rockets to begin re-entry. Like the Apollo spacecraft of the 1960s and 70s, the Dragon pierced Earth's atmosphere protected by an ablative heat shield. Parachutes deployed and the spacecraft splashed down in the Pacific Ocean off the coast of Mexico.

"This has really been better than I expected," said Elon Musk, the founder and CEO of SpaceX. "It's actually almost too good."

The test flight was the first under a NASA contract called COTS, short for Commercial Orbital Transportation Services. The contract was set up to encourage private companies to ship cargo to the International Space Station.

"This is really an amazing accomplishment for SpaceX," said Alan Lindenmoyer, NASA's Commercial Crew and Cargo program manager. "From all indications, it looks like it was 100 percent successful."

It was the second test flight for the Falcon 9, a 180-foot-tall, medium-lift booster SpaceX developed in part to service the station. The first Falcon 9 successfully launched a Dragon capsule simulator into orbit on June 4.

"We're beyond the 'Is it possible?' We did it and now we move on," said Gwynne Shotwell, president of SpaceX.

The successful mission could clear the way for a Dragon spacecraft to rendezvous with the station sometime next year, potentially delivering cargo on that flight.

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NASA/Kevin O'Connell

SpaceX's Falcon 9 rocket and Dragon spacecraft lift off from Launch Complex-40 at Cape Canaveral Air Force Station, Fla., on Dec. 8.

Discovery targeted for 2011

By Rebecca Regan
Spaceport News

Space shuttle Discovery and the STS-133 crew will have at least six more weeks to rev up for their mission to the International Space Station while ground crews at Kennedy Space Center and the Michoud Assembly Facility in New Orleans take a closer look at the spacecraft's "gas tank."

During a Program Requirements Control Board on Dec. 2, managers and engineers postponed Discovery's launch until no earlier than Feb. 3, 2011, to give teams more time to examine what caused two 21-foot long, U-shaped aluminum brackets called stringers to crack on the tank's intertank region during the Nov. 5 launch attempt.

"We were expecting to find an obvious problem," said John Shannon, Space Shuttle Program manager, during a briefing Dec. 3. "We've hit a point where there is no obvious answer and what that means is we have to take the next step."

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Inside this issue . . .

NASA/Kim Shiflett

Brevard County sixth-graders participate in the eighth annual Space Week at the Kennedy Space Center Visitor Complex on Nov. 30. Here, the students climb into a Mercury capsule in the complex's Rocket Garden. About 5,000 students will participate throughout the 11-day event, which contains fun space exploration activities designed to emphasize the importance of science, technology, engineering and math (STEM). Space Week is sponsored by NASA Education, Brevard Public Schools, Delaware North Companies Parks and Resorts, and the Florida Chapter of the National Space Club.

NASA/Kim Shiflett

Herbert Yamada, an engineer with Lockheed Martin, uses fun props to teach students about NASA as Brevard County sixth-graders participate in the eighth annual Space Week at the Kennedy Space Center Visitor Complex on Nov. 30.

Space Week gives sixth-graders glimpse of future

NASA's Educator Resource Center (ERC) worked with the Kennedy Space Center Visitor Complex to host Brevard Space Week from Nov. 29 through Dec. 10. The informal education project, with the theme "Explorers Wanted," reached about 5,400, sixth-grade students and their teachers from the Brevard County School System.

The ERC is part of the Education Programs and University Research Division. The division recently was reorganized and became part of the new Education and External Relations Directorate.

Students had the opportunity to participate in science demonstrations, meet and ask questions of NASA astronauts, ride the Shuttle Launch Experience, view IMAX 3-D movies and tour the full-size Explorer space shuttle replica. ERC staff led educational programs on topics, such as living in space and what workers do at Kennedy.

Teachers received NASA curriculum materials, posters, pictures and other resource material for use in their classrooms.

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Before the launch, NASA voiced a high level of support for the mission.

"Getting this far this fast has been a remarkable achievement," said Phil McAlister, NASA's acting director of Commercial Space Flight Development. "No matter how this spaceflight goes, we are committed to this program."

NASA wants rockets like the Falcon 9 and Orbital Sciences' Taurus II to carry important supplies, experiments and equipment to the space station after the space shuttle fleet is retired in 2011.

The rockets and capsules could one day carry astronauts to the station as well. But for this flight, the pressure was on SpaceX to demonstrate its 10-engine booster, including the second stage, and the accompanying spacecraft would work as advertised.

The next Falcon 9/Dragon launch is slated for 2011.

From **STS-133**, Page 1

That next step includes rigorous testing at two NASA centers. A tanking test on Kennedy's Launch Pad 39A is planned for no earlier than Dec. 15. During the test, engineers will record temperature and strain gauge measurements to understand what the loading of cryogenic propellants does to all 108 stringers.

Alicia Mendoza, NASA's external tank and solid rocket booster manager, said teams already have installed environmental enclosures on Launch Pad 39A, removed foam insulation and prepared the tank's skin for the locations where they will install about 89 strain gauges and thermocouples.

"It will take about three days for a combined team of Lockheed Martin and United Space Alliance technicians to bond the instruments to the substrate, apply vacuum pressure and solder more than 200 wires," Mendoza said. "Weather conditions will be the greatest challenge as the adhesives used to bond the instruments have very strict temperature requirements for application."

A few hundred workers will play a role in the tanking test, including engineers, technicians, data analysts, imagery specialists, quality and safety personnel, and management from Kennedy, Marshall Space Flight Center, Johnson Space Center and Glenn Research Center.

At Michoud, engineers will continue to perform structural evaluations on stringer test articles and mimic the stress stringers go through during the assembly process.

"The purpose of (a) test is to separate real from imagined problems, and to reveal overlooked and unexpected problems," said Bill Gerstenmaier, associate administrator for Space Operations, paraphrasing comments made by late NASA Deputy Administrator Hugh Dryden, for which NASA's Dryden Flight Research Center in California is named.

Teams spent most of November repairing the two cracked stringers, reapplying foam to the tank's exterior and taking backscatter images of the intertank to make sure there weren't any additional concerns. Gerstenmaier and Shannon commended the workers for their progress so far, but said it's time to pursue a different path.

"One good test is equal to 1,000 expert opinions, and we're at the point where we need that fine level of data," Shannon said.

With the move of STS-133, the earliest opportunity for the launch of the final scheduled shuttle mission, STS-134 on Endeavour, is April 1.

"The tanks for STS-134 and STS-335, ET-122 and ET-138 respectively, have both been thoroughly inspected for the possibility of any potential underlying structural flaws," said Mendoza. "Computed Radiography images have been taken of all 108 stringers on each tank near the liquid oxygen flange and no anomalies were detected."

NASA engineer shares Chilean miner rescue experience

By Linda Herridge
Spaceport News

NASA usually solves problems in the arena of space. But during Kennedy Space Center's Executive Safety Forum, Dec. 1, special guest speaker Clint Cragg with the NASA Engineering and Safety Center (NESC) at Langley Research Center in Hampton, Va., described the role he and three others from the agency played in helping to rescue 33 Chilean miners who were trapped nearly a half mile below the Earth's surface on Aug. 5.

Cragg traveled to Copiapo, Chile, in the northern part of the country, to serve as the NESC lead for several days. NASA's efforts at the San Jose copper and gold mine were led by Dr. Michael Duncan, who at the time was the deputy chief medical officer at NASA's Johnson Space Center in Houston. Another medical doctor and a psychologist also were part of the team.

> "Having a military background and experience serving on submarines were strengths in this situation. We wanted to make sure that the miners had useful work to do while in a confined space for what became an extended period of time."
>
> **Clint Cragg,**
> NASA Engineering and Safety Center Principal Engineer

At the request of the Chilean Space Agency, Cragg said they were asked to provide input to Chilean engineers who were designing the rescue carrier. Cragg said the team offered about 75 design features.

One suggestion was to make sure the carrier was equipped with an oxygen tank and another was that the capsule design include technology to cut down on friction it might encounter as it was being hauled up and down the rescue shaft. Another idea was to have the capsule be built so a single miner could get himself easily in and secured.

"Having a military background and experience serving on submarines were strengths in this situation," Cragg said. "We wanted to make sure that the miners had useful work to do while in a confined space for what became an extended period of time."

The medical team provided advice and guidance on safety, medical, nutritional and behavioral health issues.

"After we had sent the requirements, I got some communication from one of the Chilean Navy commanders intimately involved in the design process of the capsule," said Cragg. "He told me that they had incorporated most of the suggestions we had provided to them."

Some of the NASA recommendations included having the miners get daily exercise, establish proper hygiene and water, determine an organizational structure within the mine, establish post-evacuation set up and regime, and provide media training for the miners. Cragg also offered advice on how to organize the rescue operations at the surface.

After the rescue carrier was built and delivered to the mine site, Cragg said he and others suggested they test it by sending rescuers down first in order to convey confidence in the system.

Cragg was happy to report that Chile had implemented most of NASA's recommendations during the rescue efforts. More than two months after the mine caved in, all of the miners were safely rescued. The last miner arrived at the surface the night of Oct. 13.

Pat Simpkins, director of Kennedy's Engineering Directorate, said: "The work of Cragg and the entire NASA team, using knowledge developed through exploration of the universe, is a wonderful example of how space-related engineering and science contributes to the welfare of humanity in unpredictable ways."

NASA/Frankie Martin

Former Navy submarine commander Clint Cragg, principal engineer with the NASA Engineering and Safety Center based at NASA's Langley Research Center, was called in along with three NASA healthcare professionals to consult with the Chilean government when 33 miners were trapped 2,300 feet underground earlier this year. Cragg shared his story with Kennedy Space Center workers during an Executive Safety Forum in the Operations and Checkout Building's Mission Briefing Room on Dec. 1.

NASA/Frankie Martin

During the Executive Safety Forum, Joe LeBlanc, left, a principal engineer with ManTech International on the Safety and Mission Assurance Support Services contract, demonstrates the use of personal protective equipment with Mike Runion, who is with Innovative Health Applications.

Photo courtesy of Cecilia Penafiel, U.S. Embassy in Chile

NASA Engineering and Safety Center Principal Engineer Clint Cragg, right, consults with Rene Aguilar, deputy chief of rescue operations for the Chilean mine disaster.

Scenes Around Kennedy Space Center

Visitor Complex hosts World Peace Art Exhibit

The Kennedy Space Center Visitor Complex hosted the World Peace Art Exhibition, Nov. 19-21 to celebrate the completion of the International Space Station. This year's exhibition, coordinated by the World Culture Art Co. LTD, commemorated the international cooperation to create and build the orbiting laboratory, which promotes space activities worldwide in a borderless environment. The exhibit featured more than 180 pieces of art by Japanese artists, including sculptures, oil paintings, poetry and haiku. Guests were able to interact with select artists to discuss the artwork and conduct live demonstrations and workshops, such as Japanese style painting (above) and calligraphy (left). Selected Japanese artists designed 60 space shuttle models (below).

Photos for NASA

For NASA

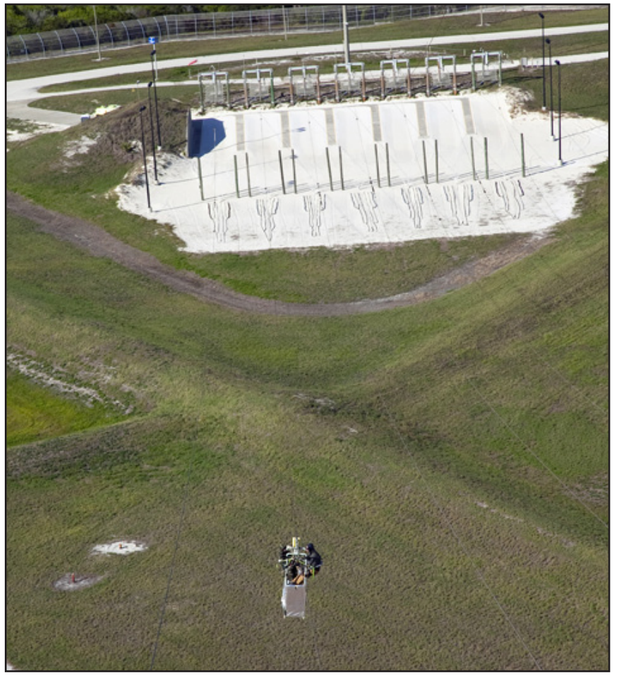
The NASA/contractor command and control development team gathered Oct. 18 to celebrate the launch control system's latest software release. This release will support ground operations requirements for future launch vehicles. Currently, the team is working on the next release of the software, which will allow end-to-end controlling and commanding of ground support equipment.

NASA/Randy Beaudoin

Orbital Sciences Corp. technicians work on cabling on the aft end of the Taurus XL rocket's first stage motor at Vandenberg Air Force Base in California on Nov. 17. To the left is the interstage associated with the first stage. Targeted to lift off Feb. 23, 2011, the rocket will take NASA's Glory satellite into low Earth orbit. Once in orbit, Glory will collect data on the properties of aerosols and black carbon. It also will help scientists understand how the sun's irradiance affects Earth's climate.

For NASA

INSPIRE student Taonga Leslie reviewed about 70 NASA science, technology, engineering and math (STEM) programs to select a few that would be appealing to upper-middle and high school students during the Interagency/Industry Training Simulation and Education Conference (I/ITSEC) Nov. 29 to Dec. 2. Leslie shared his findings with groups of students, educators and other attendees of the conference.



NASA/Frank Michaux

Workers perform routine maintenance on the emergency egress system of Launch Pad 39A at Kennedy Space Center on Dec. 2. The system includes seven slidewire baskets that can hold up to three people. The slidewire extends from the pad's fixed service structure 195 feet above the ground to a landing zone 1,200 feet to the west.

NASA

Kennedy Center Director Bob Cabana gives John Heberer with Boeing Space Operations an Exceptional Bravery Medal on Dec. 6 for his efforts during a recent vehicle crash on the NASA Causeway that ended with a compact car upside down in the Indian River.

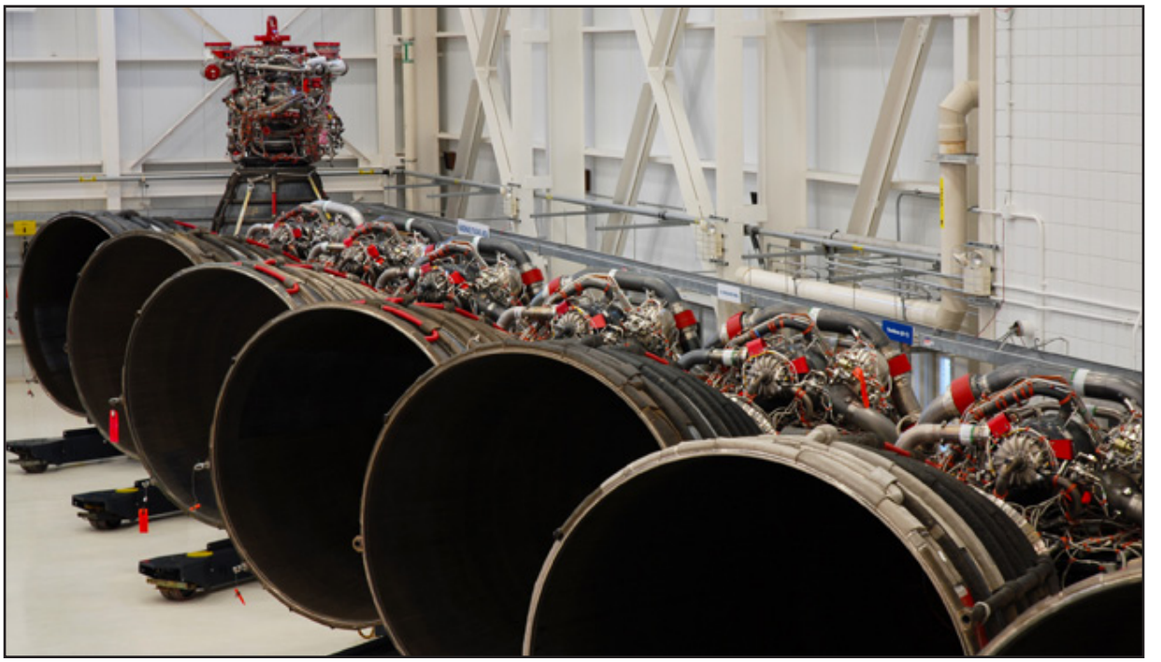
NASA/Jack Pfaller, Frank Michaux

Wild bunch dwell among spaceport

Kennedy coexists with the Merritt Island National Wildlife Refuge, habitat to more than 310 species of birds, 25 mammals, 117 fish and 65 amphibians and reptiles. Clockwise, from top left, an osprey is perched on a weather pole at a helicopter landing site near the Vehicle Assembly Building; an alligator moves stealthily through some brackish water; banana spiders are seen near Launch Pad 39A; and a Great Blue Heron catches lunch from brackish water in the Launch Complex 39 area.

Demanding design boosts shuttle engines

By Steven Siceloff
Spaceport News



For NASA/Steven Siceloff

Space shuttle main engines stand lined up in the Space Shuttle Main Engine Processing Facility at Kennedy Space Center. Known at Kennedy as "the engine shop," the facility is the high-tech work area for engineers and technicians who inspect and ready the engines for launch.

A space shuttle main engine burns at 6,000 degrees F, but the outside of the nozzle remains cool to the touch. Prior to launch, sometimes it even frosts over.

The nozzle technology that allows a finger-width of ridged metal to contain and steer flames that would boil iron is just one of the scores of innovations designers came up with for the engines three decades ago.

Such advances were critical if NASA was going to realize its plans for a reusable space shuttle that, unlike the previous rockets, would not use its engines once and then drop them in the ocean.

Some of the others:

- A system that lets the engines be incrementally throttled up and down depending on the needs of the mission

- A hydrogen turbopump that spins 567 times a second with each 2-inch tall turbine blade generating 700 horsepower.

- A computer that runs 50 health checks on the engine every second using data from 200 sensors

- A system of pipes, or ducts, that withstand pressures as high as 7,000 pounds per square inch

- A main combustion chamber strong enough to contain the explosion of 970 pounds of oxygen and 162 pounds of hydrogen fuel every second, continuously for 8 1/2 minutes

- The only heavy-lift booster engine that continuously performs all the way from launch pad to orbit

- Engineering and materials that allow the engine to be reused multiple times

- A compact, efficient design that produces eight times the thrust of a modern high.performance jet engine per each pound of weight

Added together, the innovations became a rocket engine that is more than 99.9 percent efficient, which means that almost all of its hydrogen and oxygen is used to create thrust. For comparison, an automobile engine is about a third as efficient, since most of its energy is created in the form of heat that does not turn the wheels.

"Everything in that engine is a whole science field," said Carlos Estrada, NASA's Main Propulsion Branch chief at Kennedy Space Center. "You look at the materials, you look at the components, you look at the way they designed that engine, how it's all designed for the different stages with the pump and pressures. I mean, every time you look at a component you have all these people with expertise in it."

Three main engines are used to launch a shuttle into orbit, along with help from a pair of solid-fueled boosters that separate two minutes after launch.

The advances did not come easily for designers who, working in the 1970s before computer-assisted design became commonplace, ran many of their calculations on slide rules and used judgments based on the experience they gained building massive engines for the Saturn V moon rocket.

Getting the start sequence correct alone took about a year of testing, fixing and more testing, said Dan Hausman, Pratt & Whitney Rocketdyne's site director at Kennedy. "We kept burning up the turbine blades, getting temperature spikes. Our analog models weren't that good with the start sequence. We had to figure out how to get it started because everything had an idiosyncrasy."

The idiosyncrasies he talks about are no small matter considering a single main engine creates more than four times the horsepower of the Hoover Dam.

When most people think of an engine, they usually picture a part of the engine called a bell or nozzle. It's the part that everyone sees at launch shooting flames and supersonic exhaust. Although a lot is happening inside the bell, it's one of the least active parts of the machine during launch. The real action is taking place in front of the engine bell in a maze of hidden machinery called the powerhead.

"The powerhead is the meat of the engine," said Stephen Prescott, a Pratt & Whitney Rocketdyne engineer specializing in the engine's turbopumps. "The nozzle is what's actually allowing us to gather the thrust, but the powerhead is what actually gives us the thrust."

The powerhead is home to four turbopumps, a robust computer controller and a network of ducts, wiring and valves designed to release 500,000 pounds of thrust without exploding. For as much power as it releases, the powerhead is not imposingly large. Standing above the nozzle in a workstand, the powerhead reaches about six feet from the floor. The high-pressure hydrogen turbopump, the strongest of the four, would fit on a desk.

"You run into some people who think it's easy," Hausman said. "Anybody who thinks it's easy doesn't understand it. Once you understand it, that's a marvel of engineering. It's a marvel that people can build it, and operate it and work it at the high reliability that we've done."

While spectacular malfunctions on the engines were a mark of the early part of the engine development, fixing them effectively and retesting over and over would become a hallmark of the main engine program.

Why put so much effort into the engines? Hausman credits rocket pioneer and Saturn V developer Werner von Braun with detailing the argument:

"The gist of his discussion was, if you don't build the engine right, anything above it that you put your time and money in is a waste of your time because if you don't build this right, you're not getting into space," Hausman said.

Remembering Our Heritage

Two-week mission broke duration record 45 years ago

By Kay Grinter
Reference Librarian

How far we've come since the days when two weeks in space was considered a long-duration mission. Now, astronauts heading to the International Space Station routinely sign up for six-month tours of duty aboard the orbiting research laboratory.

However, when Frank Borman and James Lovell set out on the Gemini 7 mission Dec. 4, 1965, one of their goals was to surpass NASA's previous human spaceflight duration record of eight days, set earlier in the year during Gemini 5.

Gemini 7 was planned primarily as a medical experiment. Two weeks was the maximum number of days thought necessary to complete a lunar landing mission.

Another task added late to the Gemini 7 flight plan was to rendezvous with the Gemini 6 spacecraft, a goal that was necessitated by the loss of the original target Agena vehicle for Gemini 6, although docking of the two spacecraft would not be possible.

Ironically, Borman and Lovell had met before they were selected to join NASA's astronaut corps. Both were interviewed separately for a NASA oral history project in 1999.

"He was a plebe at West Point and I was a plebe at the Naval Academy, and we traded cuff links," Lovell said, recalling his first encounter with Borman. "It was years and years later that we're sitting down at the Cape, having breakfast, when he brings up the story, and I said, 'That was me!'"

In preparation for the flight, some of the medical team suggested that a 14-day simulation of the flight might be in order. "Fourteen days sitting in a straight-up ejection seat on Earth?" Borman said. "We were able to get that nonsense kicked out in a hurry."

Regulations required that one of the astronauts remain in his spacesuit at all times. Lovell was the first to disrobe, and Borman wanted to do the same.

"For three days, the ground argued with him," Lovell said. "And the poor guy was hot, sweaty, and finally they let him get out of the suit. And of course, my young son at that time said, 'Dad orbited the Earth in his underwear,' which is essentially what we did."

The Gemini capsule provided very close quarters for such an extended stay, but the two managed amicably. "Jim Lovell was a wonderful guy to spend 14 days with in a very small place," Borman said, but Lovell recalled jokingly. "Two weeks with Frank Borman anyplace is a challenge."

"I don't know how in the world we could, but in that small area, somehow, in that small volume, we lost a toothbrush," Borman said. "We ended up sharing a toothbrush!"

When asked if the mission was like being on a Boy Scout camping trip, Borman responded, "Exactly."

They agreed on one thing.

"It was boring," Borman stated. "When you're out of attitude control fuel and you're just drifting, tumbling through space, time goes slow."

"It was tedious work, you know, two weeks," Lovell recalled. "We did have a break when (Walter) Schirra and (Thomas) Stafford came up and rendezvoused with us."

The Gemini 7 rendezvous and medical experiment was a success.

"They learned, number one, that man could live very nicely in space for two weeks," Lovell said, "that the cardiovascular system would adapt quite readily."

"Our leg muscles were shot," Borman reported, "and it took about three or four days, and you could feel it for a week or so afterwards, but it wasn't any big deal."

When asked to imagine what it would be like to live on the Russian Mir space station for six months or more, Borman responded, "It would take an awful lot of mental toughness, self-discipline . . . and a means to exercise some while they're up there. But I have great admiration for those people."

The NASA duration record set by Borman and Lovell during Gemini 7 stood until the first Skylab mission in 1973.

Michael Lopez-Alegria currently holds the NASA record for the longest time spent in space on a single assignment for his 215-day stint on the International Space Station in 2007.

NASA astronaut Sunita Williams holds the record for the longest single spaceflight by a woman at 195 days.

More online

To read these and other astronaut accounts of their spaceflights, visit Johnson Space Center's oral history website at **www.jsc.nasa.gov/history/oral_histories/oral_histories.htm**.

NASA file/1965

Prime crew for the Gemini 7 spaceflight are pilot James Lovell, front, and command pilot Frank Borman leaving the suiting trailer at Launch Complex-16 during prelaunch countdown at Cape Kennedy on Dec. 4, 1965.

NASA file

Astronauts Frank Borman, left, and James Lovell, right, present a NASA banner carried on the Gemini 7 mission to Dr. Kurt Debus. The mission doubled the length of time astronauts had lived and worked in space.

NASA Employees of the Month: December

NASA/Tony Gray

Employees for the month of December are, from left, Peter Engrand, Information Technology and Communications Services; Donald Wood, Procurement Office; Kari Heminger-Sperna, Center Operations; Richard Birr, Engineering Directorate; Kevin Grelck, Launch Services Program; and Patrick Maloney, Engineering Directorate. Not pictured are, Dawn Feick, Chief Counsel; Jonathan Donohoe, Chief Financial Office; Douglas R. Lenhardt; Constellation Project Office; Jose Garcia, Launch Vehicle Processing Directorate; and Christopher Berg, Safety and Mission Assurance.

Looking up and ahead . . .

Targeted for Jan. 22, 2011	Launch/CCAFS: Atlas V, SBIRS GEO-1; TBD
Targeted for February	Launch/CCAFS: Atlas V, GPS IIF-2; TBD
No Earlier Than Feb. 3, 2011	Launch/KSC: Discovery, STS-133; 1:34 a.m. EST
Feb. 23, 2011	Launch/VAFB: Taurus, Glory; 5:10 a.m. EST
No Earlier Than April 1, 2011	Launch/KSC: Endeavour, STS-134; TBD
No Earlier Than April 14, 2011	Launch/CCAFS: SpaceX Falcon 9, Dragon C2; TBD
No Earlier Than June 6, 2011	Launch/CCAFS: SpaceX Falcon 9, Dragon C3; TBD
No Earlier Than June 9, 2011	Launch/VAFB: Delta II, Aquarius / SAC-D Satellite; TBD
Aug. 5, 2011	Launch/CCAFS: Atlas V, Juno; Launch Window 11:54 a.m. to 12:24 p.m. EDT
Aug.15, 2011	Launch/ Kwajalein Atoll, Reagan Test Site: Pegasus, NuSTAR; TBD
Sept. 8, 2011	Launch/CCAFS: Delta II Heavy, GRAIL; 8:35:52 a.m. and 9:14:35 a.m. EDT
Oct. 18, 2011	Launch/VAFB: Delta II, NPP; TBD
No Earlier Than Nov. 25, 2011	Launch/CCAFS: Atlas V, Mars Science Laboratory; TBD

Spaceport News wishes you and yours a safe and happy holiday season

Spaceport News returns in 2011

This is the final issue of Spaceport News in 2010.
Pick up your next edition on Jan. 14, 2011.

Child Development Center gives thanks

The Kennedy Space Center Child Development Center hosted its 10th annual Thankful Dinner on Nov. 19.

Parents were invited to share a special meal prepared by Janet Bloom of the NASA Exchange.

All the traditional entrees were prepared and served to perfection.

Soon after the meal, the children took their normal nap while parents went back to work.

Photos by NASA/Jack Pfaller

John F. Kennedy Space Center

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